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(54) Tab circuit fusible links for disconnection or encoding information

TAB-Schaltungsschmelzverbindungen zur Trennung oder Kodierungsinformation

Connexions fusibles sur circuit TAB pour disconnexion ou pour le codage d'information

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Description

BACKGROUND OF THE INVENTION

[0001] The subject invention is generally directed to thermal ink jet printers, and more particularly to tab circuit fusible links that enable selective electrical isolation and encoding of information on a tab circuit for a thermal ink jet printhead cartridge.

[0002] An ink jet printer forms a printed image by printing a pattern of individual dots at particular locations of an array defined for the printing medium. The locations are conveniently visualized as being small dots in a rectilinear array. The locations are sometimes "dot locations", "dot positions", or "pixels". Thus, the printing operation can be viewed as the filling of a pattern of dot locations with dots of ink (see e.g. EP-A-0 412 459).

[0003] Ink jet printers print dots by ejecting very small drops of ink onto the print medium, and typically include a movable carriage that supports one or more printheads each having ink ejecting nozzles. The carriage traverses over the surface of the print medium, and the nozzles are controlled to eject drops of ink at appropriate times pursuant to command of a microcomputer or other controller, wherein the timing of the application of the ink drops is intended to correspond to the pattern of pixels of the image being printed.

[0004] The printheads of thermal ink jet printers are commonly implemented as replaceable printhead cartridges which typically include one or more ink reservoirs and an integrated circuit printhead that includes a nozzle plate having an array of ink ejecting nozzles, a plurality of ink firing chambers adjacent respective nozzles, and a plurality of heater resistors adjacent the firing chambers opposite the ink ejecting nozzles and spaced therefrom by the firing chambers. Each heater resistor causes an ink drop to be fired from its associated nozzle in response to an electrical pulse of sufficient energy.

[0005] A thermal ink jet printhead requires a certain minimum energy to fire ink drops of the proper volume (herein called the turn on energy). Turn on energy can be different for different printhead designs, and in fact varies among different samples of a given printhead design as a result of manufacturing tolerances. As a result, thermal ink jet printers are configured to provide a fixed ink firing energy that is greater than the expected lowest turn on energy for the printhead cartridges it can accommodate.

[0006] A consideration with utilizing a fixed ink firing energy is that firing energies excessively greater than the actual turn on energy of a particular printhead cartridge result in a shorter operating lifetime for the heater resistors and degraded print quality. Another consideration with utilizing a fixed ink firing energy is the inability to utilize newly developed or revised printheads that have ink firing energy requirements that are different from those for which existing thermal ink jet printers have been configured.

[0007] US-A-5 059 950 discloses improved electronic article surveillance tags, webs of such tags and method of making such tags are shown and described. Each tag has a resonant circuit and utilizes a flexible fuse having a supporting film or web of plastics material, a thin coating of a conductive material such as silver to provide a destructible fuse member, and spaced connectors which join the fuse member to spaced-apart circuit portions of the resonant circuit.

SUMMARY OF THE INVENTION

[0008] The present invention provides a flexible interconnect circuit by which thermal ink jet printhead cartridges can be encoded with machine readable information such as operating energy, so as to permit a printer in which a thermal ink jet print head is installed to read encoded information. The flexible interconnect circuit of the present invention is defined in claim 1.

[0009] The invention also provides an inkjet cardridge comprising such flexible interconnect circuit.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] The advantages and features of the disclosed invention will readily be appreciated by persons skilled in the art from the following detailed description when read in conjunction with the drawing wherein:

FIG. 1 sets forth a simplified schematic illustration of a flexible interconnect circuit that includes fusible links in accordance with the invention for encoding machine readable information.

FIG. 2 sets forth a simplified schematic illustration of a flexible interconnect circuit that includes fusible links in accordance with the invention for encoding machine readable information using interconnect pads of the flexible interconnect circuit.

FIG. 3 sets forth a simplified schematic illustration of a flexible interconnect circuit that includes fusible links in accordance with the invention for enabling electrical isolation between conductive elements of the flexible interconnect circuit.

FIG. 4 sets forth a simplified schematic illustration of an implementation of a fusible link structure for use in the flexible interconnect circuits of FIGS. 1, 2, and 3.

DETAILED DESCRIPTION OF THE DISCLOSURE

[0011] In the following detailed description and in the several figures of the drawing, like elements are identified with like reference numerals.

[0012] The disclosed invention is generally directed to flexible "tab" circuits such as those installed on a thermal ink jet printhead cartridge for enabling electrical connection of the printhead to the printer in which the printhead cartridge is installed. A flexible tab circuit is a

lead frame type of flexible or "flex" circuit that typically comprises a flexible planar substrate or film and a metallization pattern that is supported by one side the flexible substrate. The metallization pattern is formed by various techniques, including, for example, photolithographic formation of a copper metallization pattern followed by electrochemical plating of gold on the copper metallization. In accordance with the invention, fusible links are formed in the metallization pattern for various uses, including for example encoding information on the flexible tab circuit and electrical isolation of metallization.

[0013] Referring now to FIG. 1, set forth therein is a simplified schematic illustration of a flexible circuit 20 which contains fusible links in accordance with the invention to enable- information to be encoded on the flexible tab circuit 20. The flexible circuit 20 includes a flexible substrate 11 and a metallization pattern supported on one side of the flexible substrate, and FIG. 1 depicts the side of the flexible circuit that includes the metallization pattern. The side of the flexible tab circuit that contains the metallization is called the metallization side or the back side of the flexible circuit, while the other side of the flexible tab circuit is called the front side. When installed on a printhead cartridge, the metallization side of the flexible tab circuit is against the print cartridge and external electrical contact with the portions of the metallization pattern is made through openings in the substrate.

[0014] The metallization pattern of the flexible circuit of FIG. 1 includes elongated conductive traces 17 that extend between (a) bonding window openings 19 in the substrate where the ends of the conductive traces 17 are appropriately bonded to an integrated circuit printhead (not shown) when installed on a thermal ink jet printhead cartridge and (b) respective interconnect pads 21 which are exposed on the front side of the tab circuit 20 by the openings 15 in the substrate 11 that are represented by broken line rectangles within the perimeter of the pads 21.

[0015] The metallization pattern of the flexible circuit of FIG. 1 further includes a conductive encoding common pad 27 which is exposed on the front side of the tab circuit 20 by an opening 28 in the substrate 11 that is represented by a broken line rectangle within the perimeter of the encoding pad 27, and a plurality of conductive encoding pads 23 which are exposed on the front side of the tab circuit 20 by the openings 24 in the substrate 11 that are represented by broken line rectangles within the perimeter of the encoding pads 23. The encoding pads 23 are respectively connected by conductive encoding traces 25 to a connection pad 31 that is at one end of a wide metallization trace 33 whose other end is connected to the encoding common pad 27. In accordance with the invention, each encoding conductive trace 25 includes a fusible link 26, and information is encoded in the tab circuit by burning selected fusible links to produce a pattern of burned fusible links. For example, the pattern of burned links can be used to encode the operating energy for the printhead cartridge on which the flexible tab circuit is installed, and the printer in which the printhead cartridge is installed would read the encoded information to set the operating energy delivered to the printhead cartridge. The encoded pattern of burned fusible links is formed by applying an appropriate current pulse between selected encoding pads 23 and the common conductive pad 27, for example during manufacturing, and the pattern of burned fusible links is detected by checking the continuity between each of the conductive encoding pads 23 and the common conductive pad 27.

[0016] It should be appreciated that the wide conductive trace 31 will typically be wider than the conductive traces 25 to allow for concurrently burning a plurality of fusible links without damaging the wide conductive trace.

[0017] For completeness, FIG. 1 shows short conductive traces 18 extending between the edge of the substrate 11 and respective interconnect pads 21 and encoding pads 23. Such traces 18 are remaining portions of a metallization structure used for electroplating the metallization pattern of the flexible tab circuit. In particular, flexible tab circuit of FIG. 1 is formed from a larger substrate on which is disposed a buss bar that is formed as part of the metallization pattern of the tab circuit. The short conductive traces 18 electrically connect the interconnect pads, the encoding pads, and the conductive traces to the buss bar which in turn is connected to the electroplating system. After electroplating, the buss bar is removed and the interconnect pads are electrically isolated by removing the portion of the larger substrate that contained the buss bar, for example by die punching.

[0018] Referring now to FIG. 2, set forth therein is a simplified schematic illustration of another flexible circuit 120 which contains fusible links in accordance with the invention to enable information to be encoded on the flexible tab circuit 120. The flexible circuit 120 includes a flexible substrate 111 and a metallization pattern supported on one side of the flexible substrate, and FIG. 2 depicts the side of the flexible circuit that includes the metallization pattern. As with the flexible circuit of FIG. 1, the side of the flexible tab circuit of FIG. 2 that contains the metallization is called the metallization side or the back side of the flexible circuit, while the other side of the flexible tab circuit is called the front side. When installed on a printhead cartridge, the metallization side of the flexible tab circuit is against the print cartridge and external electrical contact with the portions of the metallization pattern is made through openings in the substrate.

[0019] The metallization pattern of the flexible circuit of FIG. 2 includes elongated conductive traces 117 that extend between (a) bonding window openings 119 in the substrate where the ends of the conductive traces 117 are appropriately bonded to an integrated circuit print-

head (not shown) when installed on a thermal ink jet printhead cartridge and (b) respective interconnect pads 121 which are exposed on the front side of the tab circuit 120 by the openings 115 in the substrate 111 that are represented by broken line rectangles within the perimeter of the pads 121. Four of the interconnect pads, identified by the references G1, G2, G3, G4 are ground pads that are intended to be connected to a common ground reference in the integrated circuit printhead with which the flexible circuit is to be utilized. In accordance with the invention, the ground pads G1, G2 are connected by a conductive trace 125 that includes a fusible link 126 formed therein. Similarly, the ground pads G3, G4 are connected by a conductive trace 125 that includes a fusible link 126 formed therein.

[0020] Each of the interconnect pads 121, except for the ground pads G2, G3 includes a short conductive trace 118 that extends from the interconnect pad to the edge of the substrate. Such traces 118 are remaining portions of a metallization structure used for electroplating the metallization pattern of the flexible tab circuit. In particular, the flexible tab circuit of FIG. 2 is formed from a larger substrate on which is disposed a buss bar that is formed as part of the metallization pattern of the tab circuit. The short conductive traces 118 electrically connect the interconnect pads and the conductive traces to the buss bar which in turn is connected to the electroplating system. After electroplating, the buss bar is removed and the interconnect pads are electrically isolated by removing the portion of the larger substrate that contained the buss bar, for example by die punching. It should be appreciated that the ground pads G2, G3 did not need to be connected to the buss bar by their own metallization traces since they are electrically connected via the fused conductive traces 125 to the ground pads G1, G4 which were connected to the buss bar by conductive traces 118.

[0021] Information is encoded in the tab circuit of FIG. 2 by burning selected fusible links to produce a pattern of burned fusible links. For example, the pattern of burned links can be used to encode the operating energy for the printhead cartridge on which the flexible tab circuit is installed, and the printer in which the printhead cartridge is installed would read the encoded information to set the operating energy delivered to the printhead cartridge. The encoded pattern of burned fusible links is formed by applying an appropriate current pulse between selected fusibly linked ground pad pairs, and the pattern of burned fusible links is detected by checking the continuity between the ground pads of each ground pad pair, for example, by causing the integrated circuit printhead to electrically isolate each ground pad pair from the ground reference potential and then checking whether the pads of each ground pad pair are connected to each other.

[0022] Referring now to FIG. 3, set forth therein is a simplified schematic illustration of a flexible circuit 220 which contains fusible links to enable isolation of conductive traces of the flexible tab circuit 220 after plating of the metallization pattern of the flexible circuit. The flexible circuit 220 includes a flexible substrate 211 and a metallization pattern supported on one side of the flexible substrate, and FIG. 3 depicts the side of the flexible circuit that includes the metallization pattern. As with the flexible circuit of FIG. 1, the side of the flexible tab circuit of FIG. 3 that contains the metallization is called the metallization side or the back side of the flexible circuit, while the other side of the flexible tab circuit is called the front side. When installed on a printhead cartridge, the metallization side of the flexible tab circuit is against the print cartridge and external electrical contact with the portions of the metallization pattern is made through openings in the substrate.

[0023] The metallization pattern of the flexible circuit of FIG. 3 includes elongated conductive traces 217 that extend between (a) bonding window openings 219 in the substrate where the ends of the conductive traces 217 are appropriately bonded to an integrated circuit printhead (not shown) when installed on a thermal ink jet printhead cartridge and (b) respective interconnect pads 221 which are exposed on the front side of the tab circuit 220 by the openings 215 in the substrate 211 that are represented by broken line rectangles within the perimeter of the pads 221.

[0024] The flexible tab circuit of FIG. 3 further includes a main ground metallization trace or buss bar metallization trace 223 that is adjacent the periphery of the flexible tab circuit. In the flexible tab circuit of FIG. 3 the main ground metallization functions as the buss bar when the tab circuit is metallized prior to its removal from a larger substrate on which the tab circuit conventionally formed. Since the ground metallization trace has functionality as part of the flexible tab circuit, it is retained as part of the tab circuit, unlike other implementations wherein the bus bar is not maintained as part of the flexible tab circuit in its ultimate configuration. Each of the interconnect pads 221 is connected to the main ground metallization trace 223 by conductive traces 225 that respectively include fusible links 226. The fusible links 226 are utilized for electroplating the metallization pattern of the flexible tab circuit. In particular, the fusible links 226 function to electrically connect the interconnect pads 221 and the elongated traces 217 to the main ground metallization trace 223 which in turn was electrically connected to the electroplating system. After electroplating, the interconnect pads 221 and elongated traces 217 are electrically isolated from the main ground metallization trace by applying an appropriate current pulse between each of the interconnect pads 221 and the main ground metallization trace 223. It should be appreciated that since the burned traces of the fuses are on the metallization side of the flexible tab circuit, the possibility of ink reaching and shorting the burned fuse traces is very small.

[0025] Referring now to FIG. 4, schematically depicted therein by way of illustrative example is a fusible link

structure 300 that can be implemented as each of the fusible links in the flexible tab circuits of FIGS. 1-3. The fusible link structure 300 comprises a component that is formed in the metallization pattern of a flexible tab circuit and includes a central fuse 300a having a width WF which is narrower that the width WT of the conductive trace 301 in which the fusible link is formed, and a length L. The fusible link structure further includes tapered traces 300b that provide a transition in metallization width between the conductive trace 301 and the fuse 300.

[0026] Preferably, the ratio WF/WT between the width of the fuse 300a and the width of the conductive trace 301 is maximized to assured that the traces to the fuse are not damaged, within space constraints and the resolution and process limits of the particular process utilized to produce the flexible tab circuit. Widening of a trace may be limited by circuit layout constraints, while narrowing of a fuse may limited by particular manufacturing capabilities. As to the length of the fuse, a longer fuse will burn more reliably, but there may be practical limits to fuse length. Typically, the length of a fuse can be between one and 10 times its width, with a likely length of about two to three times width. It is noted that including a bend in the fuse may help it burn more reliably.

[0027] By way of a particular illustrative example, typical dimensions of a fuse connected to conductive traces having a width of .004 inches would include a fuse width of about .002 Inches and a fuse length of about .004 inches (1 inch = 25.4 mm).

[0028] As to the current required to burn a fuse, the exact profile of an appropriate current pulse can, for example, be determined empirically for a particular fuse design.

[0029] The foregoing has been a disclosure of a tab circuit structure that provides for encoding of machine readable information on a circuit that is conventionally attached to thermal ink jet printheads for electrical connection between printheads and the printers in which they are installed, and which advantageously facilitates electrical isolation of conductive traces in the tab circuit that otherwise would be difficult to isolate by conventional procedures such as die punching or cutting.

[0030] Although the foregoing has been a description and illustration of specific embodiments of the invention, various modifications and changes thereto can be made by persons skilled in the art without departing from the scope of the invention as defined by the following claims.

Claims

1. A flexible interconnect circuit comprising:

   (a) a flexible dielectric substrate (11; 111; 211) having a metallized side and a non-metallized side;

   (b) a plurality of conductive elements (23, 27; 121; 221) disposed on the metallized side of said dielectric substrate over openings (15, 28; 115; 215) in said dielectric substrate so as to be contacted from the non-metallized side of said dielectric substrate through said openings; and

   (c) at least one fusible link (26; 126; 226) connected between selected conductive elements to enable selective electrical isolation between conductive elements and to enable encoding of machine readable information on the flexible interconnect circuit.

2. The flexible interconnect circuit as claimed in claim 1 wherein:

   a first conductive pad (23, 121) Is disposed on the metallized side of said dielectric substrate over a first opening in said dielectric substrate so as to be contacted from the non-metallized side of said dielectric substrate through said first opening;

   a second conductive pad (27, 121) is disposed on the metallized side of said dielectric substrate over a second opening in said dielectric substrate so as to be contacted from the non-metallized side of said dielectric substrate through said second opening; and

   said at least one fusible link (26; 126) is connected between said first conductive pad and said second conductive pad.

3. The flexible interconnect circuit as claimed in claim 2 wherein said first and second conductive pads comprise ground pads (G1, G2).

4. The flexible interconnect circuit as claimed in claim 1 wherein:

   said plurality of conductive elements (23) are disposed on the metallized side of said dielectric substrate over respective openings in said dielectric substrate so as to be contacted from the non-metallized side of said dielectric substrate through said respective openings;

   a conductive common pad (27) is disposed on the metallized side of said dielectric substrate over a corresponding opening in said dielectric substrate so as to be contacted from the non-metallized side of said dielectric substrate through said corresponding opening; and

   said at least one fusible link includes a plurality

of electrically conductive fusible links (26) respectively connected between said plurality of conductive elements and said conductive common pad.

5. The flexible interconnect circuit as claimed in claim 1 wherein:

said plurality of conductive elements comprise a plurality of conductive interconnect pads (121) disposed on the metallized side of said dielectric substrate over respective openings in said dielectric substrate so as to be contacted from the non-metallized side of said dielectric substrate through said respective openings;

a plurality of elongated conductive interconnect traces (117) are disposed on the metallized side of said dielectric substrate and respectively connected to said conductive interconnect pads; and

said at least one fusible link (126) is respectively connected between a first selected conductive interconnect pad and a second selected conductive interconnect pad such that said first and second interconnect pads are electrically connected by said electrically conductive fusible link.

6. The flexible interconnect circuit as claimed in claim 1 wherein:

said plurality of conductive elements comprise a plurality of conductive interconnect pads (221) disposed on the metallized side of said dielectric substrate over respective openings in said dielectric substrate so as to be contacted from the non-metallized side of said dielectric substrate through said respective openings;

a plurality of elongated conductive interconnect traces (217) are disposed on the metallized side of said dielectric substrate and respectively connected to said conductive interconnect pads;

a conductive trace (223) is disposed on said dielectric substrate adjacent said interconnect pads; and

said at least one fusible link comprises a plurality of electrically conductive fusible links (226) respectively connected between said plurality of conductive interconnect pads and said conductive trace.

7. The flexible interconnect circuit of claim 6 wherein said conductive trace comprises a main ground trace.

8. An ink jet cartridge comprising a flexible interconnect circuit according to any one of claims 1 to 7, said circuit being attached to said cartridge and being encoded with machine readable information concerning particular characteristics of the thermal ink jet cartridge to which said flexible interconnect circuit is attached.

Patentansprüche

1. Eine flexible Verbindungsschaltung, die folgende Merkmale aufweist:

(a) ein flexibles dielektrisches Substrat (11; 111; 211), das eine metallisierte Seite und eine nicht metallisierte Seite aufweist;

(b) eine Mehrzahl von leitfähigen Elementen (23, 27; 121; 221), die an der metallisierten Seite des dielektrischen Substrats über Öffnungen (15, 28; 115; 215) angeordnet sind, um von der nicht metallisierten Seite des dielektrischen Substrats durch die Öffnungen kontaktiert zu werden; und

(c) mindestens eine Schmelzverbindung (26; 126; 226), die zwischen ausgewählte leitfähige Elemente geschaltet ist, um eine selektive elektrische Trennung zwischen leitfähigen Elementen zu ermöglichen und um ein Codieren von maschinenlesbaren Informationen an der flexiblen Verbindungsschaltung zu ermöglichen.

2. Die flexible Verbindungsschaltung gemäß Anspruch 1, bei der:

eine erste leitfähige Anschlußfläche (23, 121) an der metallisierten Seite des dielektrischen Substrats über einer ersten Öffnung angeordnet ist, um von der nicht metallisierten Seite des dielektrischen Substrats durch die erste Öffnung kontaktiert zu werden;

eine zweite leitfähige Anschlußfläche (27, 121) an der metallisierten Seite des dielektrischen Substrats über einer zweiten Öffnung angeordnet ist, um von der nicht metallisierten Seite des dielektrischen Substrats durch die zweite Öffnung kontaktiert zu werden; und

die mindestens eine Schmelzverbindung (26; 126) zwischen die erste leitfähige Anschlußfläche und die zweite leitfähige Anschlußfläche geschaltet ist.

3. Die flexible Verbindungsschaltung gemäß Anspruch 2, bei der die erste und die zweite leitfähige Anschlußfläche Masseanschlußflächen (G1, G2) aufweisen.

4. Die flexible Verbindungsschaltung gemäß Anspruch 1, bei der:

die Mehrzahl von leitfähigen Elementen (23) an der metallisierten Seite des dielektrischen Substrats über jeweiligen Öffnungen angeordnet sind, um von der nicht metallisierten Seite des dielektrischen Substrats durch die jeweiligen Öffnungen kontaktiert zu werden;

eine gemeinsame leitfähige Anschlußfläche (27) an der metallisierten Seite des dielektrischen Substrats über einer entsprechenden Öffnung angeordnet ist, um von der nicht metallisierten Seite des dielektrischen Substrats durch die entsprechende Öffnung kontaktiert zu werden; und

die mindestens eine Schmelzverbindung eine Mehrzahl von elektrisch leitfähigen Schmelzverbindungen (26) umfaßt, die jeweils zwischen die Mehrzahl von leitfähigen Elementen und die gemeinsame leitfähige Anschlußfläche geschaltet sind.

5. Die flexible Verbindungsschaltung gemäß Anspruch 1, bei der:

die Mehrzahl von leitfähigen Elementen eine Mehrzahl von leitfähigen Verbindungsanschlußflächen (121) aufweisen, die an der metallisierten Seite des dielektrischen Substrats über jeweiligen Öffnungen angeordnet sind, um von der nicht metallisierten Seite des dielektrischen Substrats durch die jeweiligen Öffnungen kontaktiert zu werden;

eine Mehrzahl von länglichen Verbindungsleiterbahnen (117) an der metallisierten Seite des dielektrischen Substrats angeordnet und jeweils mit den leitfähigen Verbindungsanschlußflächen verbunden sind; und

die mindestens eine Schmelzverbindung (126) jeweils zwischen eine erste ausgewählte leitfähige Verbindungsanschlußfläche und eine zweite ausgewählte leitfähige Verbindungsanschlußfläche geschaltet ist, so daß die erste und die zweite Verbindungsanschlußfläche durch die elektrisch leitfähige Schmelzverbindung elektrisch verbunden sind.

6. Die flexible Verbindungsschaltung gemäß Anspruch 1, bei der:

die Mehrzahl von leitfähigen Elementen eine Mehrzahl von leitfähigen Verbindungsanschlußflächen (221) aufweisen, die an der metallisierten Seite des dielektrischen Substrats über jeweiligen Öffnungen angeordnet sind, um von der nicht metallisierten Seite des dielektrischen Substrats durch die jeweiligen Öffnungen kontaktiert zu werden;

eine Mehrzahl von länglichen Verbindungsleiterbahnen (217) an der metallisierten Seite des dielektrischen Substrats angeordnet und jeweils mit den leitfähigen Verbindungsanschlußflächen verbunden sind;

eine Leiterbahn (223) an dem dielektrischen Substrat benachbart zu den Verbindungsanschlußflächen angeordnet ist; und

die mindestens eine Schmelzverbindung eine Mehrzahl von elektrisch leitfähigen Schmelzverbindungen (226) aufweist, die jeweils zwischen die Mehrzahl von leitfähigen Verbindungsanschlußflächen und die Leiterbahn geschaltet sind.

7. Die flexible Verbindungsschaltung gemäß Anspruch 6, bei der die Leiterbahn eine Hauptmassebahn aufweist.

8. Eine Tintenstrahlkassette, die eine flexible Verbindungsschaltung gemäß einem der Ansprüche 1 bis 7 aufweist, wobei die Schaltung an der Kassette befestigt und mit maschinenlesbaren Informationen bezüglich bestimmter Charakteristika der Thermotintenstrahlkassette, an der die flexible Verbindungsschaltung befestigt ist, codiert ist.

Revendications

1. Circuit d'interconnexion souple comprenant :

(a) un substrat diélectrique souple (11 ; 111 ; 211) comportant un côté métallisé et un côté non métallisé ;

(b) une pluralité d'éléments conducteurs (23, 27 ; 121 ; 221) disposés sur le côté métallisé dudit substrat diélectrique sur des ouvertures (15, 28 ; 115 ; 215) dans ledit substrat diélectrique de façon à être contacté depuis le côté non-métallisé dudit substrat diélectrique à travers lesdites ouvertures ; et

(c) au moyen une liaison fusible (26 ; 126 ; 226) connectée entre des éléments conducteurs sélectionnés pour activer l'isolement électrique sélectif entre les éléments conducteurs et pour permettre le codage des informations lisibles par la machine sur le circuit d'interconnexion souple.

2. Circuit d'interconnexion souple selon la revendication 1, dans lequel :

une première plage de connexion conductrice (23, 121) est disposée sur le côté métallisé dudit substrat diélectrique sur une première ouverture dudit substrat diélectrique de façon à être contacté depuis le côté non-métallisé dudit substrat diélectrique à travers ladite première ouverture ;

une seconde plage de connexion conductrice (27, 121) est disposée sur le côté métallisé dudit substrat diélectrique sur une seconde ouverture dans ledit substrat diélectrique de façon à être contacté à partir du côté non-métallisé dudit substrat diélectrique à travers ladite seconde ouverture ; et

ladite au moins une liaison de fusible (26 ; 126) est connectée entre ladite première plage de connexion conductrice et ladite seconde plage de connexion conductrice.

3. Circuit d'interconnexion souple selon la revendication 2, dans lequel lesdites première et seconde plages de connexion conductrices comprennent des plages de connexion à la masse (G1, G2).

4. Circuit d'interconnexion souple selon la revendication 1, dans lequel :

ladite pluralité des éléments conducteurs (23) sont disposés sur le côté métallisé dudit substrat diélectrique sur des ouvertures respectives dans ledit substrat diélectrique de façon à être contacté depuis le côté non-métallisé dudit substrat diélectrique à travers lesdites ouvertures respectives ;

une plage de connexion commune conductrice (27) est disposée sur le côté métallisé dudit substrat diélectrique sur une ouverture correspondante dans ledit substrat diélectrique de façon à être contactée depuis le côté non-métallisé dudit substrat diélectrique à travers lesdites ouvertures correspondantes ; et

ladite au moins une liaison de fusible inclut une pluralité de liaisons de fusibles électriquement conductrices (26) connectées respectivement entre ladite pluralité des éléments conducteurs et ladite plage de connexion commune conductrice.

5. Circuit d'interconnexion souple selon la revendication 1, dans lequel :

ladite pluralité des éléments conducteurs comprennent une pluralité de plages d'interconnexion conductrices (121) disposées sur le côté métallisé dudit substrat diélectrique sur les ouvertures respectives dans ledit substrat diélectrique de façon à être contacté depuis le côté non-métallisé dudit substrat diélectrique à travers lesdites ouvertures respectives ;

une pluralité de pistes d'interconnexion conductrices (117) de forme allongée sont disposées sur le côté métallisé dudit substrat diélectrique et connectées respectivement auxdites plages d'interconnexion conductrices ; et

ladite au moins une liaison de fusible (126) est respectivement connectée entre une première plage d'interconnexion conductrice sélectionnée et une seconde plage d'interconnexion conductrice sélectionnée d'une manière telle que lesdites première et seconde plages d'interconnexion sont électriquement connectées par ladite liaison de fusible électriquement conductrice.

6. Circuit d'interconnexion souple selon la revendication 1, dans lequel :

ladite pluralité des éléments conducteurs comprend une pluralité de plages d'interconnexion conductrices (121) disposés sur le côté métallisé dudit substrat diélectrique sur les ouvertures respectives dans ledit substrat diélectrique de façon à être contacté depuis le côté non-métallisé dudit substrat diélectrique à travers lesdites ouvertures respectives ;

une pluralité de pistes d'interconnexion conductrices (217) de forme allongée sont disposées sur le côté métallisé dudit substrat diélectrique et connectées respectivement auxdites plages d'interconnexion conductrices ;

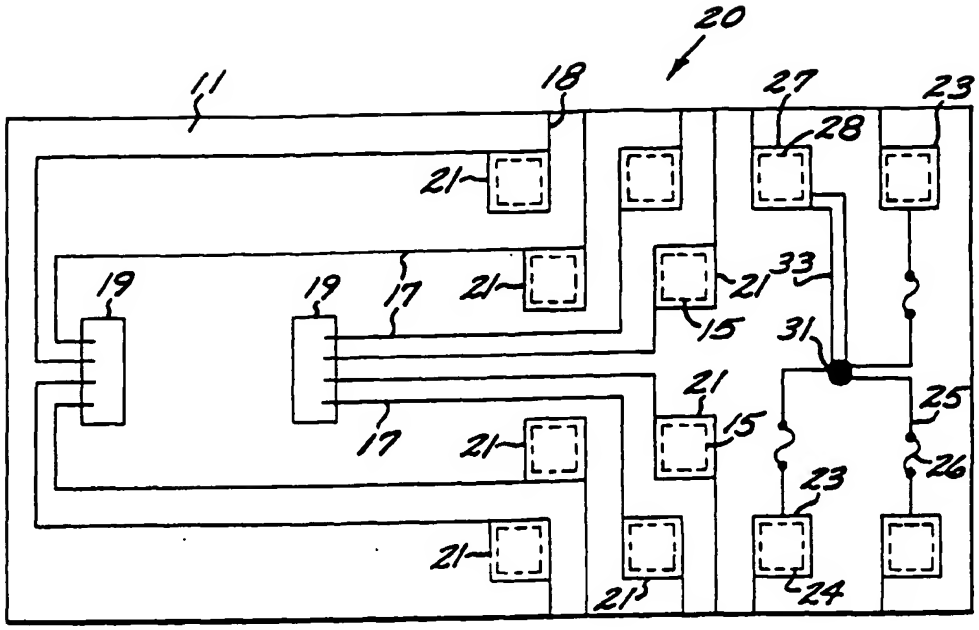
une piste conductrice (223) est disposée sur ledit substrat diélectrique adjacent auxdites plages d'interconnexion ; et

ladite au moins une liaison de fusible comprend une pluralité de liaisons de fusible électriquement conductrices (226) connectées respecti-

vement entre ladite pluralité des plages d'interconnexion conductrices et ladite piste conductrice.

7. Circuit d'interconnexion souple selon la revendication 6, dans lequel ladite piste conductrice comprend une piste de masse principale.

8. Cartouche à jet d'encre comprenant un circuit d'interconnexion souple selon l'une quelconque des revendications 1 à 7, ledit circuit étant fixé à ladite cartouche et étant codé avec des informations lisibles par la machine concernant des caractéristiques particulières de la cartouche à jet d'encre thermique à laquelle ledit circuit d'interconnexion souple est fixé.


20
11
18
27
23
28
21
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17
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33
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31
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25
21
15
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23
21
21
24

FIG.1

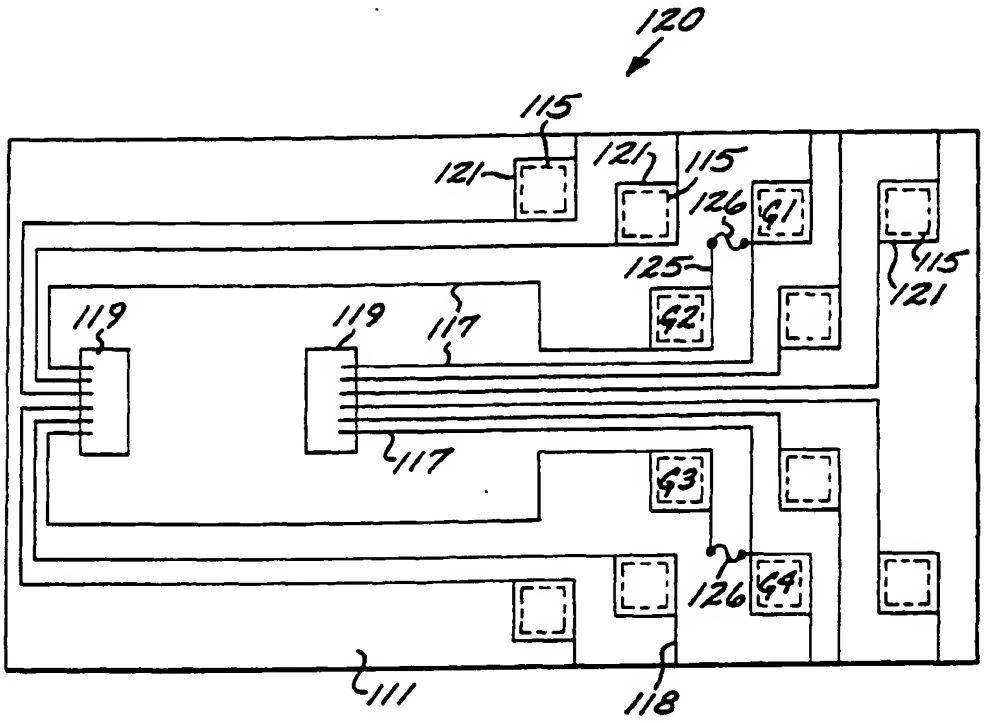
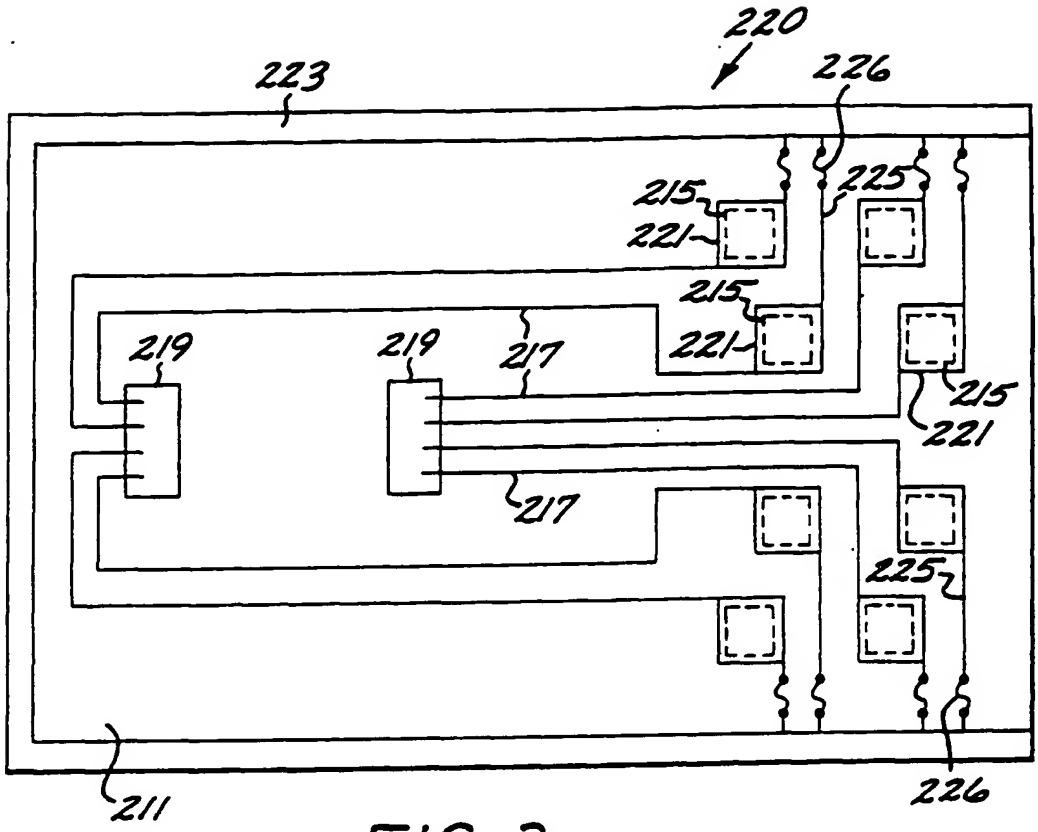

120
115
121
121
115
126
G1
115
125
121
G2
119
119
117
117
G3
126
G4
111
118

FIG.2


220
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226
225
215
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215
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219
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217
221
215
217
225
211
226

FIG.3

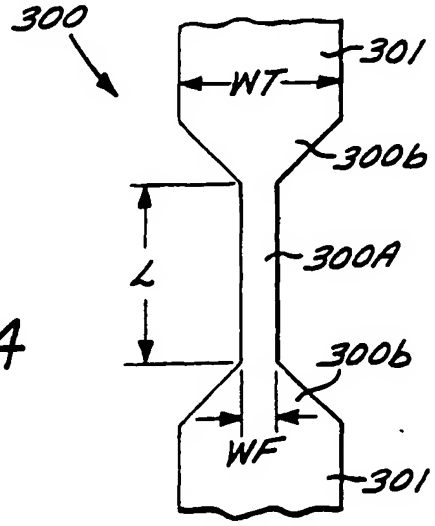
300
301
WT
300b
300A
L
300b
WF
301

FIG.4